

how intensely interesting and instructive a collection might be made. The mere mention of other subjects—Electricity, Magnetism, Acoustics, &c.—suggests possibilities of magnificent collections which might be formed, if only the public spirit of fortunate possessors could be properly roused; and on this latter point there need, we think, be no fear.

One condition, we think, ought to be insisted on: the collection which it is proposed to form should be almost entirely confined to the region of scientific research and instruction, and should include as little as possible of the practical applications of science, which, indeed, have hitherto had almost wholly their own way in our exhibitions and museums. It should be distinctly understood and acted upon, that the collection which it is hoped will be opened at South Kensington in a few months is meant to illustrate the history and methods of abstract scientific research, of the true nature of which the public know really nothing, and of teaching. Our friends the engineers and other practical men, we are sure, will see the fairness of our demand, and they are so powerful, and have hitherto been so largely represented, that they can well afford to be generous in this matter.

While one great value of the collection about to be formed will no doubt be from a historical point of view, it cannot but serve also an important educational purpose. It will let the public see how multifarious are the ways of science, will show them that it is no mere child's play, and tend to impress them more and more with the great importance of scientific education as a means of culture and mental training. When the claims of scientific research upon Government are advocated, those who are familiar with such a collection will know what is spoken of, and for what purpose the public money is wanted.

We hope, and indeed believe, that the experiment about to be tried at South Kensington is simply the first step towards something more permanent and much more extensive—in short, the fulfilment of the second part of the recommendation of the Commission quoted above. We believe that if such a collection is once formed, if it be properly organised and arranged and made perfectly intelligible to the public, both as to its theoretical principles and practical bearings, it will in time lead to a scheme as comprehensive, as complete, and as invaluable as the French Conservatoire des Arts et Métiers, to which we have frequently referred as a model which our Government would do well to copy. The unsatisfactory state of our Museums, their want of system, and incompleteness, we have often insisted upon. We think we are now on the road towards mending this latter defect; other defects can only be remedied by the adoption of the Commission's recommendation, to unite the principal collections under one responsible Minister of State. It would without doubt be greatly to the advantage both of the science and the industry of the country to have collected and arranged in one establishment, supported by Government, all the apparatus and illustrations of all the processes connected with every department of science, pure and applied, abstract and practical, instead of the heterogeneous and imperfect collections at present scattered in various buildings under different systems of management.

CAVE HUNTING

Cave Hunting. Researches on the Evidence of Caves respecting the Early Inhabitants of Europe. By W. Boyd Dawkins, M.A., F.R.S., &c. (London: Macmillan and Co., 1874.)

NO wonder that timid wanderers, peering into the dark mysterious depths of some abyss, should in their awe have peopled them with gnomes and goblins, or fancied themselves at the portals of another world. Well might poetic fancy, stirred by the thousand flashes thrown back from the spar-spangled walls of some vast cave, have called up fairy forms to give life to the beautiful stillness of the scene. Less weird and less poetic, but not less interesting, are the associations gathered by history and tradition around caves. We hear of rude tribes who habitually lived in rocky fastnesses occupying the caves for shelter and protection; and even when these were not used as permanent dwellings, we learn that in troublous times many a clan, family, or individual have had to leave their comfortable homes and betake themselves to the caves and holes of the rocks. We might well expect, therefore, that in the earliest age, when uncultured man fought for the richest hunting-ground, or struggled with nature for bare subsistence, the caves and rock-shelters should often have been his home.

We read again of the Patriarch purchasing the Cave of Machpelah as a burying-place for his family. Are we to suppose that this was a custom then newly introduced, or ask whether it was not probable that the associations of thought likely to spring up in the social life of the simple pastoral tribes of primæval man would not soon teach him to bury his dead out of his sight instead of casting them out to be devoured by wild beasts, and that he should then choose the tombs offered by nature and bury in caves? On searching for evidence on this point, we soon find that from almost the earliest time of which we can learn anything with respect to the human race, men lived and died in caves, and a later people of somewhat different habits buried in them; what the earlier race did with their dead is not quite clear.

Deposits in caves are generally more or less protected from the destroying agents which attack outside superficial deposits, and so we have in them a vast store of odds and ends, dropped, thrown away, or buried, which enable us to form a fair idea of the habits of the life of man long before the period to which history or tradition can reach back, and also of other creatures which lived with him or haunted the neighbourhood in those ancient times.

Caves are of all ages, and are formed in many ways. There are bone-bearing fissures of Rhoetic age. The phosphate beds of Caylus, full of bones of mammals, from early Tertiary to recent, are only ancient swallow-holes and caves. But the cave deposits we have to consider now are all post-tertiary, and are due almost entirely in the first instance to the decomposition of limestone rocks by the action of acidulated water. Mechanical action comes in afterwards and enlarges and finishes the work. There is, however, a difficulty as to how this action goes on in some sheltered places which rain cannot reach and where no water appears to run, such as many of the rock-shelters or abris. A probable explanation in some

cases is that a warm moist wind blows against a rock of lower temperature, and the vapour is condensed all over the surface. Minute vegetation at first, conspicuous mosses and lichens afterwards help the work, and the softer portions of the cliff melt away—here on a small scale, so as to leave marks somewhat like pholas borings; there on a large scale, leaving an overhanging sheltering ledge, such as may be seen in the sketch (Fig. 71, p. 249). Acidulated water, passing through cracks and fissures in the limestone rock, eats away the sides and enlarges its channel; but when it gets to the open air and is aerated in waterfalls or draughts, it gives off as gas the acid which helped it to hold the carbonate of lime in solution, and down this goes as stalagmite, or in some other form. Here we have a measure of time, as we can observe the present rate of accumulation, but we cannot get at any satisfactory results because the agents producing change are so many, so various, and so irregular in their action. It is not only, as Prof. Dawkins points out in the case of the Jockey Cap in Ingleborough Cave, that “it may be the result not of the continuous but of the intermittent drop of the water containing carbonate of lime” (p. 40), but the water continually stops up with stalagmitic accumulations the hole or crack through which it came; and so in many parts of that very cave we see a dry roof cross-barred with ridges representing joints, which once let water trickle through, but which are now sealed up with travertine.

Prof. Dawkins points out other sources of error in calculations based on the rate of accumulation of stalagmite.

But we have the order of succession of deposits containing various relics, and, where there is no reason for suspecting subsequent disturbance, the order is always the same. We have the identification of the style of instruments used by man, the groups of animals that lived at the different periods, with those of other deposits, the antiquity of which is measured by geographical changes. So, putting all the evidence together, we get a connected story.

Prof. Dawkins begins with the newer, and gives an account of how the civilised Celtic people were, after the Romans left, driven away to the west by the heathen Saxon—*y Saeson digred*, as they were called by the Welsh—and how they often had to betake themselves to the caves and holes of the rocks for shelter from their foes. Their remains have been found in the Victoria Cave at Settle, and the Kirkhead Cave on Morecambe Bay. Both of these are on the borders of the Cumbrian Mountains, to which the Celtic people were being pushed from the rich lowlands of Yorkshire and Lancashire, as, further south, they were driven into the mountains of Wales. Prof. Dawkins gives an interesting sketch of the history of this period; and, in commenting on the value of certain animals for purposes of classification, tells us when many of our pets and other animals were first introduced, and when many animals once wild in our country were exterminated. Though there is evidence that the dog had for ages been the companion of man, the cat seems to have been unknown before about the year 800 A.D. The common fowl and fallow deer seem to have been introduced by the Romans. The reindeer and beaver were wild in Britain after the Norman Conquest; the wild boar till

the time of James I., and the wolf till long after the Civil War. These ‘cave-folk’ were not prominent in history, but as their relics refer them to a time when events which are chronicled in history were happening in our country, Prof. Dawkins has described them under the head “Historic Period.”

But the caves have yielded also the records of long ages before that; the iron, bronze, and polished stone ages. Of this period there is no contemporaneous history in Western Europe; but who knows how much of Egyptian, Assyrian, or Chinese history may tell of events synchronous with neolithic man in Europe? This period does not appear to have been cut off from historic times by any great physical changes, and, as we shall see by and by, the Britons of to-day seem to be in part descended from the ancient race that dwelt here in prehistoric times. They were a wide-spread pastoral people, sometimes dwelling in villages of huts on land, sometimes in wooden clay-patched houses standing on piles far out into a lake. They had domestic animals, and cultivated fruits and corn. As time went on, they acquired the use of bronze, then iron, and as they lapped round the outskirts of oriental civilisation, and its influence spread, some were absorbed and some driven back to the mountains. Who, then, were these people who lived just before our historic times? Is any part of the population of modern Europe directly descended from them, or were they all exterminated and their place taken by the invading wave of population? Prof. Huxley has pointed out the twofold type that may be found in some peoples that have for centuries been looked upon as one race. Cæsar, he reminds us, found two types of Celts in this country, the fair and the swarthy. In England of to-day we find, speaking English and calling themselves Englishmen, the same two types, the Xanthochroid and the Melanochroid. Huxley further points out that throughout the south-west of Ireland, South Wales, west and south-west of France, Spain, Italy, Greece, &c., the dark characters prevail, while anyone travelling from North Ireland across Scotland, Flanders, Germany, &c., would see none but fair people all the way. He thinks the dark complexions may have been inherited from Iberian ancestors, whose more direct representatives we have in the Basques. The fair-haired invaders did not exterminate, but absorbed or united with a great conquered population of dark-skinned people; and these two races, each we must suppose of great “prepotency of transmission,” have handed down their distinctive characters for centuries; sometimes one, sometimes the other predominating. We must therefore bear in mind that the people included under the term “neolithic” in no way form one ethnological group. Neolithic is a useful temporary term to represent a phase of culture which different races reach and pass, and to which a different relative position in time must be assigned in different parts of the world. New forms, new metals, or new languages, may have come in with invading tribes and have been adopted by the now mixed race; but there is no evidence of an entire sweeping away of the older fashions at any period from neolithic times to our own.

But long before those times also we have abundant records of man’s sojourn in Western Europe. Who and of what race were these earlier or palæolithic folk? Their

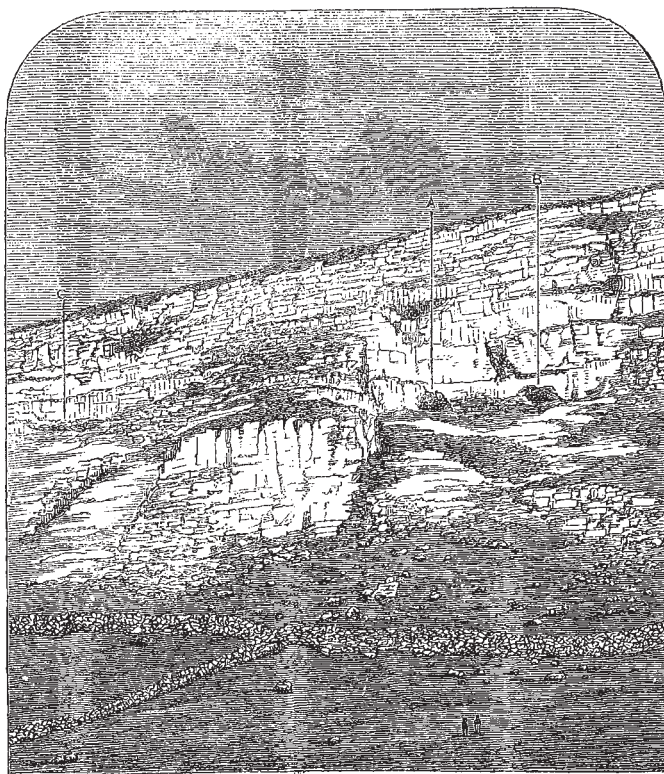
state of civilisation and habits of life, inferred from their remains, point to the dwellers along the Arctic shores, and especially to the Eskimo, as their nearest representatives. Who the Eskimo are is not known, but a broad-skulled race seems to be following them from the east as the broad-skulled race of later neolithic times did the long-skulled people of the earlier neolithic age, who were separated from them by differences of racial character quite as strong as any we have in the present state of the evidence any right to assume existed between the neolithic dolicocephali and the palæolithic people.

Prof. Dawkins finds osteological affinities between the Basques and the earlier neolithic Troglodytes, and Mr. John Rhys follows this up by pointing out peculiarities of construction in the Welsh language which he thinks may

be explained by the idioms having been derived from an Iberian tongue. It seems agreed that we have in the neolithic people a mixture of an Aryan and Turanian race. May it not be that the Basques are the direct descendants of a palæolithic tribe who were not quite absorbed, but who have gone through a neolithic phase of culture, and that the Eskimos may, when we know them, turn out to be another palæolithic tribe banished by the Aryan invaders to the far north, and living still in the same rude way that they did in palæolithic times?

However, this is at present mere speculation; the data before us do not furnish sufficient evidence to enable us to come to any satisfactory conclusion on this point.

There have been no great geographical changes since neolithic times. The hand of man has done perhaps



View of King's Scar, Settle, showing the entrances of the Victoria and Albert Caves (from a photograph). A, B, Victoria; C, Albert.

more than nature towards modifying the climate of Western Europe since that period. The surface of the country was then "covered with rock, forest, and morass, which afforded shelter to the elk, bison, and urus" (p. 262). When man had felled the woods and drained the land, the country must have become perceptibly dryer and warmer.

But, in tracing back the history of man, we meet with a great difficulty at the close of the early stone or palæolithic period. There is generally a gap. We ask, Why did not the use of polished weapons come in gradually, so that we might find a few polished weapons at first, then more as we search the deposits of more recent date; just as bronze and iron were gradually introduced among the stone-using people, but did not at once supersede the use of that material? Why, in the deposits along rivers and in

caves, is there so often evidence of a great lapse of time between their occupation by the palæolithic and neolithic folk? Why is the group of associated animals so different? Why is it that, where deposits belonging to these two periods have been found together, there is generally evidence to show that they were separated in age by an enormous interval, during which considerable geographical changes have been brought about by the gradual operations of nature? This has induced many to seek for some cause of a general kind to explain the sweeping away of the old order of things, and the incoming of a new and different group. Of course geologists seek first an explanation in the glacial period. But wherever the deposits containing the remains of palæolithic man have been found in connection with boulder-clay, and their relation can be made out, the implement-bearing beds are

found resting on the drift in a manner that shows that they were laid there long after the deposition and even subaërial erosion of the glacial deposits.

In one cave on the borders of the Lake Mountains it was, and is still, hoped we may find out something more definite about the relation of the palæolithic to the glacial period.

In the absence of direct evidence, such as the overlap of boulder-clay over the mouth of the cave or the cave deposits, Prof. Dawkins remarks: "The probable date of the introduction of the contents into ossiferous caves in glaciated areas may be ascertained by an examination of the river deposits. If the animals found in the caves inhabited the surrounding country after the melting of the ice, their remains will occur in the post-glacial gravels. If they are not found, it may be inferred that they had retreated from the district before the latter were deposited" (p. 410); and, as Mr. Tiddeman has pointed out, there could be no pre-glacial remains in the gravels where there had been glacial erosion, as that must have swept out all the incoherent river deposits. By this test, Prof. Dawkins goes on to say, "the Pleistocene strata in the Victoria Cave, near Settle, may be considered pre-glacial, as well as the hyæna den at Kirkdale" (p. 411).

It was once thought that we were getting the direct evidence we sought for. At the entrance of the Victoria Cave, says Prof. Dawkins, "ice-scratched Silurian grit-stones are imbedded in the clay, which abuts directly on the cave loam, and passes insensibly into the clay, with angular blocks of limestone, within the cave. They may possibly be the constituents of a lateral moraine *in situ*, as Mr. Tiddeman suggests, or they may merely be derived from the waste of boulder-clay which has dropped from a higher level,"—that is, from the broken ground seen in the accompanying sketch on the left of the Victoria Cave. "The latter view seems to me to be most likely to be true, because some of the boulders have been deprived of the clay in which they were imbedded, and are piled on each other with empty space between them, the clay being carried down to a lower level and re-deposited" (p. 121).

Though we cannot yet make out clearly the relation of man to the glacial period, or explain the gap between palæolithic and neolithic deposits, this we do know—that man lived in this country and throughout Western Europe with the lion and hairy elephant, the hyæna, and woolly rhinoceros. He was probably more or less nomadic, following the urus and the elk, and shifting from place to place as they migrated with the seasons. That in his weapons of warfare and the chase he resembled the dwellers on the shores of Arctic seas, and from the associated animals probably lived when continental conditions and higher mountains produced much greater extremes of climate than are found in the same countries now. In many places he probably followed hard on the receding glaciers, before the advance of which, perhaps, his ancestors retreated. That although we cannot assign a date to his first or last appearance, we must refer him to a period so remote that wide valleys have been scooped out and whole races of animals have been exterminated since his time, but how long it took to bring this about we cannot yet tell.

Prof. Dawkins having qualified himself for the study by

acquiring an intimate knowledge of the osteology of the animals apt to be found in such places, has been long engaged in collecting the evidence which caves furnish as to the early inhabitants of Europe, and has given us the result of his researches in a very readable volume, which, we doubt not, will reach another edition, and reappear with the correction of many small inaccuracies and inconsistencies, such as would be likely to occur in putting together the evidence collected through a series of years, during which Prof. Dawkins' own views were undergoing some change as new evidence was forthcoming, and the researches and views of other observers were being brought before him.

OUR BOOK SHELF

The Descent of Man, and Selection in relation to Sex. By Charles Darwin, M.A., F.R.S. Second Edition, revised and augmented. Pp. 688. (Murray: 1874.)

SINCE the first edition of this great work was reviewed in these pages (*NATURE*, vol. iii., pp. 442, 463), it has been repeatedly reprinted without any important change. But the new issue differs, not only in form, but also in many important additions, from the first. In spite of the added material, the whole work is now comprised in a single volume scarcely larger than one of the previous two. For this purpose the print has been much compressed, and the paper is thinner. The leaves have also been cut. So that although in some respects more convenient, the present form is less pleasing than the original one. We would suggest the desirableness of publishing a library edition of this and Mr. Darwin's other works, uniform with "*Animals and Plants under Domestication*," so that the *opera omnia* of our great biologist may stand ranged in a well-ordered row, printed in legible type with ample margin on opaque paper, fit to be clad in the sober dignity of russet. The present volume looks more like a school cram-book than a treatise which makes a generation illustrious. A prospectus has just reached us from Stuttgart of a German translation of the works of Mr. Darwin, by Victor Carus, to be published in numbers, with photographic and woodcut illustrations, portrait, indices, &c., and to be completed in ten handsome volumes. It would surely not be creditable were there to be no corresponding edition in English.

A list of the principal additions and corrections made in this edition of the "*Descent of Man*" is prefixed, and shows at a glance that the most important additions have been on the subject of Sexual Selection.

The whole treatise is now divided into three parts: *The Descent of Man*; *Sexual Selection generally*; and *Sexual Selection in relation to Man*. The two somewhat disjointed sections of the original work are thus combined into more of an organic unity. Beside innumerable references to the vast literature bearing on the subject scattered through the periodicals and books of travel of the civilised world, there is an important contribution by Prof. Huxley, on the resemblances and differences between the brain of man and that of apes, which occupies seven closely-printed pages. This and other valuable additions make this edition necessary to biologists as a work of reference, though most will probably prefer the earlier one for reading. P. S.

Manuals of Elementary Science. Zoology. By Alfred Newton, F.R.S. (Society for Promoting Christian Knowledge, 1875.)

A BIRD'S-EYE view of a science from the hand of one who, during many years, has devoted most of his thinking time to the investigation of its principles and details, is certain to have a vigour and freshness about it which must be as